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Advancing the field of organizations through the study of military organizations

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This article argues that the field of organization studies may learn from closer study of decision-making and behaviors in military organizations. It describes some of the intellectual roots of organizational studies within a strategic, military context; discusses some recent characteristics of strategic competition that organization scholars may find fruitful to study; and view some of the key contemporary challenges in military organizations through the lens of strategic organization design, a framework the builds on, and integrates, several streams of research in organizational behavior that have implications for, and influence, how organizations make strategic decisions.

JEL classification: H56, H4, M1, L1.

1. Introduction

While the field of organization studies is mostly concerned with issues relating to business organizations, there is great potential in closer interaction between the fields of organization studies and military organizations. Asymmetric conflict, technological change, and challenges related to organizational design challenge today's militaries and have dramatically impacted military decision-making and behaviors; impacts that may not only inform the field of organizational studies but also open

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new areas of research. Both fields—organization studies and military organizations—are interdisciplinary by nature and have important overlapping intellectual roots. Cross-fertilization between the two fields of study is not just still relevant—but also *needed* for advancing both organizational scholarship and understanding practical aspects of organizing.

This article argues that the field of organization studies may learn from closer study of decision-making and behaviors in military organizations. The idea that military issues are also organizational issues predates the field of organization theory, just as "organizations" existed long before academics started writing about them. Classic military theorists such as Sun Tzu and Clausewitz both noted how organizational issues permeate military strategy.[1] Clausewitz also noted that organizational properties relating to failures and friction, in conjunction with phenomena akin to bounded rationality, create a "fog of war" that makes clear decision-making in battle difficult (Watts, 1997). Max Weber discussed how the division of labor and hierarchical decision-making characterized militaries in Western societies and that, as bureaucratization increased, the feeling of obligation to serve changed from individuals to institutions. Later, military strategists used techniques that became part of organizational theory, as they aimed to frame and understand the behavior and decision-making processes of nations, particularly that of the Soviet Union and its allies. There had been contributions from different social sciences to understanding organizational issues relevant to the military before, but the Cold War helped facilitate a more interdisciplinary and focused discussion. The Research ANd Development (RAND) Corporation, for example, facilitated interdisciplinary discussion and research in the area of organizational theory, particularly as it applied to military organizations.[2] Yet, while the ideas of strategic competition and organizational studies have changed and advanced since this period, we argue that its primary focus has shifted from public to private organizations and there is less direct intellectual communication between academic scholars and military analysts (perhaps because institutions such as RAND are not easy to find) (Augier and March, 2011; Augier and Guo, 2012).[3] We argue that there is paucity of discussion related to the

[1] Sun Tzu, for example, wrote, "Therefore those skilled in military operations achieve cooperation in a group so that directing the group is like directing a single individual with no other choice." Clausewitz wrote, "If we think of the complex organization of a great armed force, of the quantity of details that come into play when employed, we can understand that combat of such a force must also acquire a complex organization with parts subordinated one to the other and acting in correlation" (Sun-Tzu and Clausewitz, 2000).

[2] RAND itself housed many academic scholars including Armen A. Alchian, Kenneth J. Arrow, Charles E. Lindblom, James G. March, Oskar Morgenstern, John F. Nash, Richard R. Nelson, John von Neumann, Herbert A. Simon, Oliver E. Williamson, Sidney G. Winter.

[3] RAND of course does still exist but is no longer doing the same kind of research that in the 50s and 60s created the unique environment conducive to learning between disciplinary boundaries (Augier and March, 2011).

challenges facing military organizations today and we endeavor to open avenues for future research in this article.

Our hope is to inspire contemporary organizational researchers to consider military organizations as valuable sources of insight for organizational studies and for the exploration of new topics. First, we note that the divergence of organizational and military studies had led to absence of comparative studies and, more importantly, analysis of the evolution of military organizations. Military decision-making may inform the development of the field of organizations studies by providing empirically relevant and challenging research problems. Second, advances in economics and organization theory have influenced research on military topics to foster a deeper understanding of the evolution of military threats (Cohen and Gooch, 1991; Allison and Zelikow, 1999; Allison, 2005). Third, organization scholars have, at least occasionally, found inspiration in military problems and history when advancing their work (March and Weissinger-Baylon, 1986; Eden, 2004). Finally, organization scholars have offered insights relevant to understanding military decision-making (Schein, 1996). We therefore argue that the present study is well grounded in prior work that has explored the two-way relation between organizational studies and military topics.

The remainder of the article is structured as follows. We first examine some of the intellectual roots, in particular the role RAND played in the development of organization studies and the need to revive this interdisciplinary discussion. The third section briefly reviews the similarities and differences between private and military organizations. The fourth section discusses challenges facing military organizations, to include leaderless enemies and technological change. We then discuss the idea of strategic organization design and suggest how it can be applied in the military context. The final section concludes and offers suggestions for future research.

2. Organization studies meets military organizations and decisions: some history

Interestingly, many of the early analytical issues and problems considered in military strategy emerged out of similar concerns that are not unlike the ones we highlight. The work on these topics was, in particular, focused around the work at the RAND Corporation in the 1950s.[4] RAND was one result of the post World War II—recognition of the need for a group of scientists working full time on military matters in peacetime. Rather than simply negotiate contracts with university faculty, the Scientific Advisory Board to the Army Air Forces Chief of Staff decided to establish a think tank with elements of being a pure research institution; yet, initially they believed it had to be housed in an industrial research facility to gain stability and

[4] For an extended discussion of the role and development of RAND, see Augier and March (2011).

attract top-flight scientists to work for them. In particular after its reorganization in 1948 as an independent research corporation, RAND's mandate began to expand beyond mere weapons planning for the Air Force, and it quickly became an institution involved in research on decision-making and behavior under conditions of uncertainty. As RAND hired more social scientists, its scholars pioneered research across a broad range of social sciences, importing techniques from systems analysis, game theory, linear programming, and in many cases, established the intellectual basis that continue to underpin the state of knowledge in these fields today.[5] RAND further operated under the premise that military problems did not conform to disciplinary boundaries and did not often fit a particular academic category very neatly. Frequently, once employees began research projects, the projects would migrate through several departments, involving researchers of different skills.

In a number of ways, we can observe the benefits of the interaction between the academic disciplines, including organizational theory. First the fields' interaction influenced certain developments in rational choice and game theory. Kenneth Arrow in 1951, for instance, wrote his classic book, *Social Choice and Individual Values,* while he was at RAND. Inspired by Bergson and Tarski, Arrow showed that it is impossible to construct a mathematical mapping that translates individual preferences into an aggregate preference function, given weak assumptions about the expression of preferences and principles structuring the aggregation process (Bergson, 1938; Tarski, 1946; Arrow, 1951).[6] Second, the interaction between military issues and scholars led to increasing awareness that a more behavioral and organizational perspective should perhaps replace rational choice theory. Some researchers became increasingly convinced that agents were not as rational as game theory desired; an observation that questioned the validity of rational choice theory, in particular as regards its ability to provide adequate answers to complex problems. Human actors, for example, made mistakes in decision-making; selected suboptimal actions because of biases that were not "rational"; and, in some cases, behaved rationally within bounds and irrationally outside these bounds. Flood conducted a set of experiments supporting the notion that agents did not behave

[5] The social science department at RAND was set up in 1948, in part because it was realized that an emphasis on systems analysis and quantitative research could not fully capture the essence of warfare. Being at heart caused by human nature, analysis of warfare required many disciplines to work together; in particular, it needed insights gained from the "soft approaches" in the social sciences to understand issues relating to psychology, political science, economics, and anthropology and sociology.

[6] These minimal requirements including that there be no dictator, that individual's preferences be positively reflected in the group's preference, that the outcome not be imposed independently of individual's preferences, and that individuals be permitted to adopt any set of preferences, seemed to represent noncontroversial features consistent with democratic decision-making.

rationally (Flood, 1952, 1958; Poundstone, 1993).[7] As a result, the Air Force gradually realized the need for a broader version of economics, to help understand and illustrate the Cold War issues and the complex behavior of individuals and large organizations, such as the Soviet Union.

Third, the obvious lack of knowledge about behavior of large (military) organizations also inspired developments in organization theory that went well beyond rational choice theory. Thus, the RAND strategist, Andrew Marshall, started building a community at RAND around behavioral perspectives on organizational decision-making, inviting Herbert Simon, James March, Michel Crozier, Graham Allison, and Sidney Winter (among others) to participate.[8] The behavioral perspective stimulated scholars at RAND to begin thinking about bounded rationality, evolution, the effects of technological changes, and other things that are important in modern (organizational) economics. Alchian, for example, attempted to provide a theoretical basis for the prescription that many firms should risk their money coming up with multiple alternative weapons system designs and prototypes (Alchian, 1950, 1952). Interestingly, this work encompassed the claim that rational prediction of the future was essentially futile, and that one should not rely on the complete rationality of all participants.[9] RAND's conference on organization theory in August 1951 further cast doubts on rational choice theory.[10] Others, including Herbert Simon, Allen Newell, and James G. March, developed ideas on bounded rationality and behavioral economics.

Our fourth example is the one that most directly relates to the development of organization studies and also to what organizational insights can offer. In the late 1950s and early 1960s, the academic insights on behavior and decision-making were evolving into the field of what is now known as "organization theory." Marshall

[7] This research led to the Prisoners' Dilemma.

[8] As Marshall recalls, "It was clear to me that what we were trying to forecast in the Soviet military was the behavior of these large organizations. At that time, there was a tendency to think of such an organization as almost a single rational planner. This rational, maximizing planner is planning the whole Soviet force, and the organization is logical and rational and all that nonsense. . . . And it clearly wasn't true. It was clear to me that there were many factors influencing the kind of decisions that were made in these organizations. To me, the alternative to viewing organizations as rational planners was to look at organizational behavior as the output of complicated organizations with habits and histories and practices and so on" (Unpublished interview with Andrew Marshall, p. 11).

[9] Alchian was for a time involved in an important debate at RAND about the use of systems analysis and the possibility of planning future weapons systems (Alchian, 1952, 1953). Ultimately, this latter program did not dictate how such systems as the ICBM were built. But it also did have unintended consequences for economics for when Alchian hired Sidney Winter and Richard Nelson to do research on technological change and weapons research, it was the beginning of a fruitful collaboration that led to important work on the economics of technological change (Nelson and Winter, 1982).

[10] Arrow, Morgenstern, Flood, and Newell (among others) participated.

managed to find the early pioneering ideas and the scholars behind them (in particular, Cyert, March and Simon), and built on their ideas to provide a better understanding of Soviet military behavior. Nations were, like organizations, systems of decision makers, rules, and hierarchies; they were constrained by bounded rationalities and limited information. Nations were guided (or blinded) by rules and norms and had conflicting and possibly ambiguous goals.[11]

Marshall was so convinced of the promise of organization theory that he and Sidney Winter led an effort at RAND to set up a unit for the study of organizational behavior. Marshall also recruited several people to work with him, including Jim March, Pat Crecine, Michel Crozier, Graham Allison, and others.[12] For example, Graham Allison's well known book (Allison, 1971) was the result of him being rapporteur on Marshall's meetings, discussing the limitations of the rational perspective. Marshall continued thinking about the importance of organizations for strategic thinking, and began thinking about setting up a new program in the area of organizational behavior at RAND. Marshall and Winter (1967) noted the significance of such a program area for RAND, and how it would specifically have the behavioral perspectives on decision-making and limited rationality as a starting point:

This program area comprises a variety of studies of organizational decision-making and behavior. In predicting or prescribing for organizational decision-making, economists and systems analysts have typically assumed that it could be regarded as an activity of a single deciding unit, with well-defined preferences, knowledge of a reasonably wide range of action alternatives and their consequences, and enough computational capacity to discover the preferred course of action. [However] close observation of the actual process of decision-making in large organizations has almost always turned up an impressive list of reasons for doubting the descriptive accuracy of this unitary rational decision maker model.

As a result, Marshall proposed a program that would help develop the tools for understanding organizational decision-making, with explicit focus on the Carnegie school's ideas:[13] "The primary substantive focus is on the decision-making of

[11] Marshall, for example, noted the importance of replacing the rational choice perspective with a more behavioral and empirically valid one: "In the context of the intelligence estimating problem, the hope is to replace the current rational process model with something better, something that reflects more accurately the context and the constraints within which Soviet military posture incrementally evolves, as the result of a sequence of decisions over many years" (Marshall, 1968: p. 2).

[12] Nelson and Schlesinger argued that RAND should try and get some more theorists in this area who were on the "intellectual and professional frontier" of the fields, focusing in particular on organization theory research (Nelson and Schlesinger, 1963).

[13] The Carnegie School refers to the ideas and work of particularly Cyert, March, and Simon (Earl, 1989), and the subsequent developments in organization studies (Argote and Greve, 2007; Gavetti and Levinthal, 2004).

military organizations, while the main point of departure, in terms of method, is the recent work of Cyert, March, Simon, et. al." The intent was to begin a long-term project, carefully researching all the existing contributions to organizational behavior, and to extend and adapt the ones suitable to understanding of military organizations. Although the program failed to materialize at RAND (in part because both Winter and Marshall left), the emphasis did survive; it became one of the most important intellectual foundations for *net assessment*; a framework that has produced research and strategic assessment for defense for more than 30 years (Augier, 2013).[14]

With this history in mind, we believe that the divergence of military studies and organizational studies during the previous decades has led to an absence of analysis on the evolution of military organizations. This is regrettable because military organizations have evolved considerably since the end of the Cold War. For example, the presence of asymmetric warfare—where parties have access to very different resources and strategies—adds a whole additional layer or dimension that organization scholars ought to be interested in. Yet, there is a paucity of discussion on how military organizations adapt to the changing nature of warfare, a paucity that we endeavor to address in this article. Organization scholars can learn about general mechanisms and principles of organizing by improving their understanding of how they are expressed in a military context. Such scholarship would also reintegrate the now separate fields of public organizations and organization theory. Yet many of the best contemporary discussions of military issues that discuss organizational aspects come not from organization scholars but from people with experience in military strategy or in the discipline of history.[15]

[14] According to the foundational document: "Our notion of a net assessment is that it is a careful comparison of US weapon systems, forces and policies in relation to those of other countries. It is comprehensive, including description of the forces, operational doctrines and practices, training regime, logistics, known or conjectured effectiveness in various environments, design practices and their effect on equipment costs and performance, and procurement practices and their influence on costs and lead times. The use of net assessment is intended to be diagnostic. It will highlight efficiency and inefficiency in the way we and others do things, and areas of comparative advantage with respect to our rivals. It is not intended to provide recommendation as to force levels or force structures as an output" (Marshall, 1972: p. 2).

[15] For example Barry Watts, who have done important contributions to national security strategy research and practice and Wick Murray (a military historian) noted that inability or unwillingness of military organizations to admit failures is a barrier to organizational adaptation. Sometimes, they argue, this is caused by the fact that military organizations are mostly operating in peacetime although they must be prepared for wartime: "Effective military organizations adapt their prewar assumptions and concepts to reality. However, most military organizations and their leaders attempt to impose prewar conceptions on the war they are fighting, rather than adapting their assumptions to reality. In that case, they adapt only after great losses in men and national treasure" (p. 5).

3. Organizational perspectives: private versus military organizations

While business and war are often thought of as two separate and distinct activities, analogies abound that business is akin to war and that war is akin to business.[16] Competition, whether for market share or land, is central to the activities of both types of organizations. The bounds on competition, however, differ significantly in wartime. Private businesses typically cannot use lethal force to gain control over customers, ideas, and resources. Business also differs significantly in that there is a measure of effectiveness, profit, that has no direct analogy for military organizations. A military organization may be so proficient that it creates a "catastrophic success,"[17] whereby military success creates a significant post-war stabilization and reconstruction problem. A business that managed to achieve a similar success would likely view this development as an opportunity to increase profitability.

Businesses and military organizations may also create externalities, though we argue that the scope of such externalities varies by type of organization. While private businesses may create negative externalities through pollution, lack of adherence to product and safety regulations, and corrupt practices, the scope and magnitude of these externalities is dwarfed by those created by military conflict. Conflict, by destroying public and private infrastructure, may create incentives for future conflict. The "collateral damage" of conflict results in noncombatant fatalities, which often far exceed that of direct combatants. Finally, conflict may undermine the social contract, increasing perceptions of risk, and transactions costs; ultimately undermining prospects for future growth.

While businesses and military organizations may differ in terms of their ability to measure success and the magnitude of impact on society, these organizations share similarities that are worthy of study. Adaptation often lags until environmental pressures force the organization to change or perish.[18] The last decade has seen a variety of new organizational forms in business and in conflict. In business, joint ventures, alliances, networked firms, and other types of organizational structures

[16] "Rather than comparing [war] to art we could more accurately compare it to commerce, which is also a conflict of human interests and activities; and it is still closer to politics, which in turn may be considered as a kind of commerce on a larger scale" (Clausewitz, 2009). For another example, Sun Szu's book on the Art of War (Tzu, 2011) has been hugely influential on the way business leaders think about strategy; there are even a few Sun Tzu institutes around advising businesses on strategic issues.

[17] President Bush, in 2004, referred to rapid and decisive military operations in Iraq in 2003 as a "catastrophic success." The military operation was so successful that that military was not prepared for the transition to stabilization and reconstruction operations.

[18] Militaries have often been accused of preparing to fight the last war while businesses may become overly dependent on their previous success. In each case, the lack of innovation and adaptation may lead to failures, not only in terms of the objectives of the organization, but of the organization itself.

have appeared (and disappeared) in attempts to cope with the dynamics of the global economy. In warfare, we have observed a demand for increased interconnectivity, the restructuring of military organizations to promote modularity, and the rise of asymmetric warfare. We suggest that the question of how private and military organizations address the strategic problem of rapidly adapting to influence a dynamic environment is worthy of further study.

The forces of centralization and decentralization have continued to stress military organizations in combat akin to the stresses of globalization on private businesses. Consistent with this, business and organization theorists have argued for the evolutionary advantages of organizational structures that have no clear hierarchy and are relatively decomposed (Simon, 1996). Yet, competitors or enemies that have no clear leader and are functioning through an ecology of decomposed organizational structures is at the heart of today's military challenge (Allison, 2005). Likewise, business organizations can no longer be defined with clear boundaries and are often thought of as dynamic, complex and adaptive systems with semi permeable boundaries. In both the military and business contexts, the idea of organizations as complex dynamic systems is essential. In both fields, features of such systems—such as decomposable organizational structures and dynamic competencies—also invites better understanding of the culture and motivations of the participants (Simon, 1996). Highly decentralized, uncoordinated hostile efforts are unlikely to destroy and open and democratic society, but they can cause great aggravation and disruption. They can neither win nor can they be readily defeated. While a comparative analysis may provide actions of common interest, the unique response of military organizations should also be of great interest to the field of organizational studies. We believe that the evolution of Western militaries during the past two decades in response to asymmetric warfare that is typified by decomposable organizational structures warrants further research.

4. Adaptive organizations and organizational adaptation

The configuration of an organization has inescapable strategic implications. An organization is the instrument, or vehicle, that enables collective action, but it also channels the learning and replication processes that define future capabilities. We believe that the full implications of this insight tend to be overlooked, both in business and military organizations. Airline mergers have been fraught with danger because of the variations in learning and replication processes between the merging airlines.[19] The US Army changed its focus from the division to brigade

[19] In the most recent merger between United and Continental Airlines, for example, differences in pilot work rules caused considerable conflict. Pre-merger United's work rules permitted the outsourcing of pilots who flew sub-70 seat airplanes, while Continental's work rules only permitted the

element in the past decade, in part to create a "modular" force.[20] The Brigade Combat Team (BCT) gained assets (e.g. intelligence and surveillance) that previously were the purview of division and corps elements. This organizational change improved the ability of BCTs to more rapidly adapt to environments but may have come at the cost of being able to integrate into division sized maneuver elements (Kugler, 2008). These, and other, examples can serve to expand our knowledge of the intimate relationship between strategy and structure.

Two contrasting perspectives have informed research on adaptive processes in organizations (Levinthal, 1991). One line of research has studied organizational change as an adaptive process at the level of firms and other individual organizations (Cyert and March, 1963; Lawrence and Lorsch, 1967). Another line of research has emphasized adaptation as a population level phenomenon, where selection forces change the industry-wide properties of firms, including product technology, efficiency, and size (Hannan and Freeman, 1989). It is easy to see that these two perspectives are complementary when we recognize that they are rooted at different levels of analysis, i.e. the individual organization versus the population level.[21]

Adaptation at the level of the individual organization can happen in two distinct ways. One is through a change in the internal states of individual elements in response to demands from the organization's task environment. This process is widely referred to as learning. The classical treatment of learning processes views organizational performance as a function of the accumulation of experience.[22] Learning curves usually illustrate this relationship. A huge literature has fitted mathematical models to learning curves that were obtained from laboratory experiments on individual human actors as well as from time series of (market) data from business organizations.

The second route to organizational adaptation is a selection process. Rather than changing the internal states of individuals (within organizations), it would seem that a selection process could generate learning curves by replacement of those individuals that have unacceptably low performance. In the classical literature

outsourcing of pilots who flew sub-50 seat airplanes. The merged airline attempted to impose the pre-merger United work rules. United lost in arbitration and also alienated pilots from both pre-merger airlines (Snyder, 2011).

[20] Before this change in organization, the main organizational element in the US Army was the division, consisting of three maneuver brigades and support elements. A division has ~10,000–17,000 soldiers, while a brigade consists of 3000–5000 soldiers.

[21] The literature offers much discussion of selection and of learning as conflicting processes in organizational adaptation. Since the selection processes at a lower level of analysis may drive higher-level learning, the two processes are often two sides of the same coin. Apparent differences may entirely be attributed to the level of analysis that different researchers apply.

[22] Performance can be measured as words typed per minute, number of pizzas made per hour, strength or accuracy of response, or entirely different measures of efficiency and effectiveness.

on mathematical psychology, this process is known as replacement learning. This perspective considers changes in the population of individuals (e.g. their level of education or experience) as a function of intraorganizational selection processes. Both perspectives on organizational adaptation are useful because they have well-defined empirical counterparts.

The traditional view on adaptation by learning is that a number of cognitive and behavioral limitations complicate this process. An organization has a limited grasp of the possible alternatives that it may pursue. Rather than engaging in an enlightened rational process, the organization adapts its features and policies through limited experimentation that lead to incremental improvements. This process is known as local search. Local search is a process that allows the organization to gradually increase performance over time in a stable context. For a military organization, local search may be akin to peacetime training that focuses on accomplishing specific tasks to a predetermined standard. In principle, sufficient training should lead to incremental improvements in a unit's readiness.

Interdependencies among the elements in the organization's task structure and the policies that define this structure (i.e. division of labor) further complicate the process of local search.[23] When there are no interdependencies, a process of local search may reliably identify the global optimum. As the number of interdependencies increases, the local search process is increasingly likely to lead to a suboptimal end-state.

During the development of the US Army Transformation Plan in 2003–2004, for example, one proposal was to divide the Army into two distinct organizations: the first focused on combat, the second on stabilization and reconstruction. Proponents argued that it is difficult to educate, equip, and train the organization to conduct these two distinct types of operations simultaneously. This proposal was rejected in favor of a "full spectrum" organizational model based on the assumption that the Army could prepare across the "full spectrum" of operations simultaneously. As the command of combat units has traditionally signified selection to higher rank and responsibility, this created an incentive for units to focus on traditional combat operations vice the less glamorous (but critical) noncombat operations. The structure, in essence, stimulated a process that redefined the strategic potential of the force.

It is easy to see that different search strategies may have huge implications for the realization of strategic objectives conditional on the task environment in which the organization operates. Since the organization's task and information structures essentially define the organizational search, we point to the configuration of the organization as a critical strategic factor. This is because the structure of the organization will inevitably influence the identification of viable alternatives. A particular

[23] The role of interdependencies in local search is studied in the literature that uses the NK-model for organizational analysis (Levinthal, 1997).

organizational structure will open distinct avenues and thereby define the set of viable options. The strategic potential of the organization is thereby, to some extent, defined by its structure, irrespective of whether leaders and managers appreciate this fact.

While the common analysis of search processes assumes that feedback is readily available and easy to understand, limited feedback and noisy performance indicators further complicate organizational learning. Since organizations adapt to better match the demands of a particular task environment, it is problematic if they get infrequent and unreliable feedback. Such problems are likely to make learning practically useless and thereby put emphasis on selection forces (replacing organizations that fail to meet environmental demands). This intuition, however, might be misleading.

Recent work on computational models indicates that unreliable feedback may actually benefit organizations that operate in complex task environments (Knudsen and Levinthal, 2007). Military organizations may have substantial periods where feedback (combat) is unavailable[24] and thus provide a unique laboratory to examine how organizations adapt to dynamic environments with infrequent, and potentially, unreliable feedback. Proxies for feedback (training), no matter how realistic, may be discounted as unreliable if these proxies expose flaws in an organization's structure, strategy, or doctrine.[25] How military organizations proxy for feedback during peacetime and, more importantly, how these proxies influence adaptation in wartime should be of great interest to the fields of organization and military studies, alike.

The military organization is also adapting to succeed when the next challenge presents itself. The next challenge, as noted previously, may be years in the future. Within North Atlantic Treaty Organization (NATO), this has lead to the emergence of Capabilities Based Planning (CBP) to generate a probable set of scenarios to establish definitions of the task environment. CBP is an explicit attempt to prevent adaptation to historical experience (preparing to fight the last war) or a random set of objectives (blind adaptation). One of the criticisms of CBP, however, is that it tends to codify the existing organizational structure and capabilities, that is, the probabilistic scenarios are endogenous to the existing organizational structure.

[24] For the US Army, for example, there have several significant peacetime intervals between major combat operations. World War I–II (1918–1941), World War II-Korea (1945–1950), Korean War-Vietnam (1953–1961), Vietnam-Gulf War (1973–1991), Gulf-War-Afghanistan (1991–2001).

[25] In 2002, the US DoD conducted a war game of the United States versus a notional Middle Eastern country. The commander of the Red Team (Enemy), General Paul Van Ripper, ignored the script of the war game and deployed his forces to take advantage of their mobility, lack of logistical support, and other asymmetric features relative to the Blue (US) Team. By the end of the first day, the Red Team has imposed significant damage on the Blue Team. The war game was then reset and the Red Team told to follow the 'rules.' General Van Ripper resigned in protest and the US forces then proceeded to win the war game (http://www.guardian.co.uk/world/2002/aug/21/usa.julianborger).

Further exploration of how military organizations adapt (or fail to adapt) toward an uncertain future should be of great interest by itself but also from a comparative perspective with respect to private organizations. There is an open and as yet unaddressed need for a rigorous theory of adaptation in social organizations, be it military or private. Such theory would identify alternative principles of adaptation for a situation in which multiple agents act at multiple levels of organization to adapt their behavior and structure in response to the changing demands of a nonstationary environment. Understanding how different classes of task environments reward different adaptive principles would amount to a genuine breakthrough in academic research on strategy and organizations.

Future research could thus address the questions of why military organizations adapt, how adaptation differs in peacetime versus wartime, and how organizational structure influences adaptation. Researchers may also wish to explore how situations where the context is adapting, while, at the same time, the organization is adapting to the context.

5. Technology, adaptation, and military organizations

Adaptation, from a military and business perspective, is a necessary but not sufficient condition for the long-term survival of the organization. Adaptation without commiserate improvements in efficiency may render the organization unable to leverage its insights into a competitive advantage. Technological change is improving awareness of the battlefield but may have unintended consequences for organizational learning and adaptation. In this section, we review these forces and argue that there are insights to be gleaned by the further study of military organizations.

5.1 Technological change versus confidence in technology

A source of tension in the military structure is emerging from relatively recent innovations in command and control systems. While the advent of radios allowed politicians and higher-level commanders to issue orders to lower-level units,[26] ambiguity persisted with regard to the position of these units and their status. Commanders relied on radio chatter, observed maneuvers, and symbols plotted in grease pencil on a map to discern the location and disposition of units under their command.[27] This is, however, no longer the case. New technologies allow commanders at the strategic level, who are often thousands of miles removed

[26] Adolf Hitler, for example, would issue daily orders to individual units.

[27] One of the authors fondly remembers attempting to plot unit dispositions in an armored personnel carrier traveling at >30 km an hour. Needless to say, this system of tracking was subject to error on many levels.

from tactical operations, to "peer into" the fog of war and attempt to impose their preferences on tactical units.

The Force XXI Battle Command Brigade and Below-Blue Force Tracker (BFT) use the Global Positioning System (GPS) to provide near real-time information regarding the position (and with two-way devices, status, and intent) of BFT-enabled units.[28] Vehicles and rotary aircraft equipped with BFT continuously transmit and receive data on nearby forces, allowing tactical commanders greater precision in positioning and maneuvering their forces. BFT data are also aggregated up the chain of command to operational and strategic levels.[29] Ideally, BFT should reduce fratricide that accounted for 24 % and 12 % of deaths in the Gulf War and in the initial invasion of Iraq. BFT data, when combined with intelligence from manned and unmanned aircraft, should also enhance a commander's situational awareness as to friendly and enemy units (Singer, 2009).

While BFT has, for those units equipped with it, improved command and control and situational awareness, there is an inherent conflict between the state of the technology and expectations about the capabilities of the technology. Organizationally, this tension presents a unique adaptation challenge in a hazardous, uncertain environment where erroneous information may lead to fatalities. If the confidence of senior leaders outpaces the efficacy of the technology, this may have significant impacts on the organization's ability to learn and adapt.

What evidence is there that senior leadership has more confidence in technology than the capabilities produced by the technology? If we observe, for example, that senior leadership is bypassing the organizational hierarchy, then this may suggest that the leadership has more confidence in the technology (and their ability to command), then the lower levels in the organization. During the initial invasion of Iraq in 2003, General Franks, Commander of the United States Central Command (CENTCOM), used BFT to determine that units of the Army's Vth Corps were at idle (Gordon and Trainor, 2006). Failing to move decisively forward violated Frank's approach to warfare; he used the BFT information to castigate his land-forces commander (and subordinate units). The problem, however, was that while BFT displayed the position of US forces, it failed to capture the asymmetric nature of the fight. Iraqi irregulars were engaged in heavy combat with US forces but since these irregular forces did not "belong" to a specific unit, they did not appear on the BFT.

In a 2010 survey of Marine Corps officers with combat experience using the BFT, 63% reported receiving commands directly from a headquarters higher than their

[28] BFT has been in use by the Army since 1999 as part of the Army's digital transformation program. The latest upgrade is the Joint Command Platform; however, both versions are known as Blue Force Tracker.

[29] A general overview of BFT: http://www.defense.gov/transformation/articles/2004-11/ta112204d.html.

immediate command (Dreier and Birgl, 2010).[30] While 52% reported no shift in tactical decision-making, 37% did report a shift toward higher echelons. More interesting, from an organizational perspective, is the bifurcation of the survey responses when broken down by type of command. Among aviators, 83% believed that BFT shifted decisions to higher levels of command, while 65% of ground officers felt that BFT had no influence on the level of decision-making (Dreier and Birgl, 2010).

Engagement by higher level headquarters in tactical decision-making is not limited to BFT. Reports are rife with examples of flag-rank officers using Unmanned Aerial Vehicle (UAV) feeds to "dial into" the battle to order tactical commanders to engage in a specific course of action. While the senior commanders will argue that they are ensuring the correct outcome, there is significant concern about flattening the chain of communication without a commiserate flattening of the command structure. In other words, we are now observing "tactical generals" (Singer, 2009). This evidence suggests that more senior commanders have confidence in their ability to digest the information from BFT and other sources and directly order the actions of tactical units.

We believe that the organizational response to BFT, UAVs, and other new technologies is worthy of further research. First, how the military organization learns and adapts to these new technologies may lag behind the confidence in senior leaders in how technology may change their perception of the battlefield. Second, the organizational response to this technology may not be uniform, that is, it may simultaneously decentralized and centralize decision-making, dependent on the combat function in question. Why this is occurring is an unanswered and, from our perspective, especially intriguing question.

5.2 Implicit contracts and micromanagement

Tactics is the employment of units in combat, to include their arrangement, maneuver, understanding of the enemy and terrain, so as to translate combat power into victory (United States Army, 2001). The United States has prided itself over time for its ability to improvise and adapt to the enemy and conditions, and tactical commanders are typically provided with a great deal of command flexibility.[31]

[30] If a company commander, who normally receives orders from a battalion commander, received orders from the brigade or higher-level commander, this would result in a positive response in this survey.

[31] A quote, often attributed to an unknown Russian military document or German officer, sums this view of American military doctrine: "One of the serious problems in planning against American doctrine is that the Americans do not read their manuals nor do they feel any obligations to follow their doctrine."

The US doctrine argues that tactics is a science and an art, and devotes considerable discussion to the art of tactics.

> "The *art of tactics* consists of three interrelated aspects: the creative and flexible array of means to accomplish assigned missions, decision making under conditions of uncertainty when faced with an intelligent enemy, and understanding the human dimension—the effects of combat on soldiers (United States Army, 2001)."

The "fog of war" is a term to denote the uncertainty surrounding the battlefield. Various organizations have approached this "fog" by developing doctrine that either emphasizes rigidity or flexibility. The Soviet Army, for example, used rigidity, emphasizing the need for commanders to follow prescribed tactics, techniques, and procedures (TTPs). Akin to a recipe, the Soviets intended this warfare approach as a means to use overwhelming numerical superiority to overcome uncertainty on the battlefield. On the other hand, when faced with the Soviet approach to warfare in the Cold War, the US Army emphasized flexibility. Local commanders should and could respond to conditions as they saw fit to achieve military objectives. In essence, Soviet doctrine emphasized a behavioral-based contract (adherence to doctrine), while the United States emphasized an outcome-based contract (tactical success with strong emphasis on adaptation).

Both approaches, however, are based on the implicit assumption that the disposition and location of forces were unknown, an assumption that, in many cases, is no longer true in terms of conventional warfare. UAVs and BFT now allow soldiers at all levels to receive significant information about the local environment. A squad, the lowest unit in a military organization, can now deploy micro-UAVs, meaning that an 8–10-man unit now has an independent, unmanned reconnaissance capability. Persistent UAVs, able to loiter for hours over the battlefield, provide a continuous stream of information to the operator. Combined with tactical surveys, satellite information, UAV data, joint targeting aircraft, and other methods, the military organization has a much clearer picture of the operating environment. Yet, this information is a double-edged sword.

We argue that the "fog of information" is replacing the "fog of war." Commanders now struggle with an abundance of information. UAVs, for example, present a narrow view of the battlefield and, yet, this view can easily become the dominant view of the battlefield. Multiple streams of data must now be "fused" into a coherent picture of the battlefield, requiring ever increasing amount of staff. Headquarters staff, for example, has expanded considerably since World War II and Vietnam; we argue that this expansion is in part an attempt to deal with the abundance of information.

The fog of information has led to the rise of the Battlefield Update Assessment (BUA) culture, a regularly scheduled update to the commander as to the status of the mission, forces, materials, and other significant issues. Senior staff present the

BUA to the commander, who, at higher levels of command, appears remotely on a large screen projected in front of the staff (West, 2011). The increasing bureaucratization and imposition of a rigid command hierarchy has increased the disconnect between senior and field commanders and has, in some cases, resulted in unreasonable demands for information at the tactical level. The rise of the term "fobbit,"[32] meant to denote an individual who never leaves a forward operating base (FOB) for the duration of their deployment, is indicative of the split between cultures between those who fight and those who serve on staff.

While the abundance of information is a problem that may overwhelm the existing organization structure, the seduction of information poses a more difficult issue. Strategic commanders now have the ability to lift the "fog of war" and communicate directly with lower level units on the battlefield as if they have complete information about the tactical environment. Yet, as noted above, the senior commander's view is distorted, as it relies on sensors and UAVs that may not provide a complete picture of the battlefield. Strategic commanders may fixate on this picture of the battlefield, becoming, in essence, four-star company commanders. By losing strategic focus, the commander is no longer as effective; we argue that this loss of effectiveness is due to the "fog of information."

We are concerned that technology may shift the contract from supervisor to subordinate from an outcome to behavioral basis. If senior commanders continually use technology to observe the actions of subordinate units, local commanders will respond accordingly and engage in risk-adverse measures. Local commanders will ask senior commanders to provide guidance on tactical operations, encouraging the emergence of a "zero-defect" culture that was prevalent in the Army in the 1990s. In other words, if every possible action could be a career-ending mistake, tactical commanders will seek "cover" by allowing higher-level commanders to "call the shots." Innovation and adaptation may slow, undermining the flexibility that is a hallmark of American military doctrine.

These concerns suggest questions for future research. First, is there sufficient empirical evidence to conclude that new technologies are increasing oversight, reducing tactical flexibility, and altering the organizational hierarchy? Second, how has risk aversion evolved in the US (and other) military organizations since 2001? Is there evidence to suggest a movement from outcome to behavioral-based contracts? Has micromanagement led to a reduction in innovation and adaption, independent of technology? Finally, what does a comparative analysis of the struggles of private organizations to learn and adapt to changes in technology suggest for military organizations? What are the similarities between adaptive processes in private and military organizations, and why do they occur?

[32] The term 'fobbit' is a clever play on the mythical race of Hobbits, who never left the Shire.

6. Replication and military organizations

Military organizations, as with business entities, struggle with the dissemination of knowledge. While business organizations continuously operate in one mode of operation, military organizations alternate between peacetime and wartime modes that are not distributed symmetrically across time. Militaries may also rely more on authority to ensure the high-fidelity replication of routines. In this section, we briefly discuss the concept of replication before examining the replication of knowledge by military organizations.

Human learning, as opposed to learning in other animals, is often cumulative from generation to generation as cultural transmission replicates knowledge. Cultural transmission involves replication of habits where parents, teachers, or drill sergeants instruct individuals. Such replication from individual to individual is a fundamental process in the evolution of culture (Boyd and Richerson, 1988, 2005; Durham, 1992a,b; Power *et al.*, 1999). Individuals acquire habits of language, social norms, taboos, role conceptions, personality types, and professional skills from parents (vertical transmission) and other teachers (horizontal transmission). Akin to individuals, organizations acquire knowledge through replication, in that a large portion of the knowledge that resides in any organization is handed down from the past, whether it is technical knowledge or norms that define appropriate behavior.

Evolutionary theories of economic change consider replication of routines as well as the replication of individual habits. Routines are organizational dispositions to energize particular patterns of behavior in a group of people.[33] The important point is that organizations can replicate routines. Much in the same way that biological evolution replicates genes, the evolution of organizations replicates routines. The replication of routines would seem to be comparatively easy when it takes place in a common culture with shared knowledge and understandings. A single community of practice would be an obvious example. If there are low demands on performance and minimal managerial interference, *some* habits and routines are likely to emerge. They would serve the purpose of easing task completion for community members even though they would probably not be very efficient. A similar case would be the emergence of habits and routines within organizations where clear aims, monitoring, and error-correcting mechanisms are absent. Left to themselves, organization members would be able to satisfy at very low levels of performance. Their activities, however, are not likely to add much value to the organization or its customers and stakeholders.

While routine formation without error correction is remarkably easy and probably very widespread, the management literature reports great difficulties in

[33] For more technical definition and references to the literature on routines, see (Hodgson and Knudsen, 2010).

replicating routines that embody best practices. This is because highly ambitious targets regarding effectiveness and reliability usually constrain routine replication in management. Managers typically replicate routines with the purpose of transplanting superior production processes from one context to another, but this seems to be difficult.

The empirical literature has provided evidence on the persistence of routines, yet researchers cannot fully account for the conditions that determine the reliability of routine replication. Since routine replication is an essential ingredient in military training, we believe that there is much to be gained from careful examination of the ways habits and routines are drilled into new recruits. Once acquired, it is also interesting to consider the decay of military relative to other types of routines. Since routines are a defining feature of the organization's task structure, it is further compelling to understand whether unreliable replication of routines introduces drift in the underlying definition of the task structure.

Reliable replication of knowledge across organizational units and across time is a fundamental problem. The context is a form of coevolution that models of industry evolution capture. The industry is changing at the same time as firms are adapting to it. Classical models of industry organization have assumed this problem away by imputing high powers of rationality to the players. This assumed rationality allows the players to solve the problem of competitive interaction in offline mode by conjecturing that an agent plays best response under the assumption that everyone else will also play their best response. In effect, this approach eliminates the adaptation problem by assuming it away. Behavioral and evolutionary approaches, in contrast, assume fairly modest levels of rationality to players and thereby reintroduce an interesting coevolutionary adaptation problem. While it is fair to say that much remains to be done with respect to the theoretical underpinnings of this problem, there is a basic observation relating to the patterns of change in the context of these two types of organization. In a business context, firms adapt on a fairly regular basis as they change the scale, and the nature of their operations to continuous fluctuations in demand conditions and market dynamics.

Both military and business organizations adapt to a context that is changing. For military organizations, this challenge may be compounded by the interludes between periods of intensive "online search," that is, combat. The rather infrequent demand for the services of military organizations would seem to induce more "punctuated" and abrupt transformations. Military organizations operate on a similar scale of adaptation in conflict, but not in peacetime. Peacetime operation deprives military organizations of any direct feedback from serious engagement with "competitors." If the next serious conflict is 10 years down the line, they may adapt to an imaginary future conflict, but they lack the urgent need to do so. Compounding the difficulties of noncontinuous online search is the risk that the findings of the past search may not hold germane lessons for the future.

An example that illustrates how the strategic focus of the organization can alter knowledge replication appears in the context of the Small Wars Manual (SWM), originally published by the US Marine Corps in 1940 (Schaffer, 1996). The SWM contained lessons learned from the Philippine campaign, a counter-insurgency operation where the Marine Corps acted as a constabulary force. While some parts of the SWM are antiquated (e.g. provisions for mules), other parts are immediately applicable. The SWM, however, was out of print in 2003 and had largely been forgotten by a Marine Corps focused on amphibious warfare. The strategic focus of the Marine Corps had shifted over time so that knowledge related to a constabulary mission was not replicated throughout the organization. After 2003, however, the demand from tactical units for the SWM was sufficient for publishers to place it back into print. The Commander of Marine Forces for Tactical officers, of their own volition, started using the knowledge of the SWM in Iraq and Afghanistan and this resulted in publishers putting the book back into print. This replication of knowledge being formal when the Commander of Marine Forces assigned to the US Central Command made the SWM required reading for senior Non-Commissioned Officers, and field grade officers deploying to Iraq and Afghanistan (Small Wars Journal, 2007).

There appears to be a fundamental difference in the rate of change between military and business organizations in that military organizations appear to change at a slower pace. Additionally, there appears to be a prominent fundamental distinction in the nature of change that these two types of organization are facing. Even in wartime, not all of the force is engaged in the fight, that is, military organizations (even when at war) alternate between peacetime and conflict modes. A typical unit in the US Army may deploy for 12 months and return to rest, reconstitute, and retrain for 24 months.[34] The Marine Corps, on the other hand, limits deployments to 6–7 months with dwell time around 24 months. In peacetime mode, fairly stable conditions should provide an ideal organizational context for the replication of knowledge. Contrast this observation with the fact that most business organizations are, roughly, operating only in one mode of engagement.

In an effort to improve the replication of knowledge, the US military has fostered the use of immediate After Action Reviews (AARs) to capture innovations and, more importantly, failures. Local adaptations may contain valuable information about TTPs that, if not disseminated, can lead to organizational failure. This information is distilled into "lessons-learned" and discussed at the small unit level. Informally, leaders use discussion boards to speed the dissemination of information. Formally, the military captures these lessons in databases for further analysis. At the same time, we haste to add that replication does not imply rigidity in doctrine. A professional military relies on small unit competence with regard to TTPs to generate combat

[34] The US Army reduced combat deployments to 9 months starting in January 2012 (Baldor, 2011).

power; small units are thus judged on their ability to train to standard. TTPs, however, can only approximate the skills required in warfare and local commanders often find themselves in positions where there is not a doctrinal answer.

To replace the outdated Jeep, for example, the US military placed the High Mobility Multipurpose Vehicle (HUMMV) into service in 1984. Like the Jeep, the intent of the HUMMV was to provide transport behind the front lines and thus the HUMMV lacked ballistic armor. HUMMVs performed well during the Gulf War (1991), Bosnia and Herzegovina (1995–2005), Kosovo (1999–present), and Afghanistan in 2001–2002. As Improvized Explosive Devices (IEDs) proliferated in Iraq in 2003–2004, however, the "soft-skinned" HUMMV became a tactical liability and units responded by crafting improvised armor with scrap metal. Even though Secretary Rumsfeld dismissively responded to the need for these platforms[35], pressure from the lower levels of the organization led to the formal "up-armoring" for HUMMVs and the eventual creation of Mine-Resistant Ambush Protected (MRAP) vehicles. The intensity of adaptation in wartime created significant pressure for the organization to adapt to a new threat, replicate tactics to mitigate the impact of IEDs, and strategically change the direction of the organization with regard to wheeled vehicle procurement.

The capture and replication of knowledge in military organizations should thus be of keen interest to those who study business organizations. Adaptations and innovations must be quickly replicated throughout the force yet the mechanisms by which this process occurs are not well known outside the military. Is the type and speed of replication a function of the type of knowledge? If so, is it because the demand on replication in the military is more modest than it is in business organizations (e.g. with respect to amount of knowledge that is transferred)? Or is it because the organizational context is more stable? Or, it is a result of some other factor? Addressing these intriguing questions is likely to enhance our general understanding, and thereby advance our theories of replication processes in a business context. This is yet another example of a contrast that invites comparative study of adaptation in military and business organizations. A more informed analysis may add a number of interesting details. For example, one may argue that the context of war is replaced by a context of politics when the military organization is operating in peacetime mode. For another example, business organizations that experience failure will ultimately exit from the industry. But it is not very often the case that a national army is completely dissolved after it retreats from the battlefield.[36] It appears that the forces that shape military organizations are primarily driven by learning and

[35] In a meeting with soldiers in 2004, Secretary Rumsfeld famously pushed back against complaints of "hillbilly armor" by stating that "you go to war with what you have" (Cornwell, 2004).

[36] The dissolution of the Iraqi army by the Coalition Provision Army in 2003 is often blamed as fostering the conditions that led to the Sunni insurgency.

development, whereas the selection process may seems to have a more pronounced role in shaping the business organization.

7. Strategic organization design

Strategic organization design views the organization as the primary instrument for achieving strategic objectives for it is through the organization that the strategy is realized. As the context becomes more dynamic, the importance of organization design increases. This is because creative ways of adapting take precedence over reinforcement of stable positions.

Considering recent developments in warfare, we find a move from emphasizing positioning advantage, in terms of seizing key terrain, toward a dynamic concept of interaction that stresses the strategic role of organization in new and interesting ways. The latter half of the 20th century witnessed the emergence of asymmetric warfare as the predominant form of warfare on the modern battlefield. While the forces in conflict in World War I, World War II, and Korea were well defined, the conflict in Vietnam, Afghanistan, and Iraq has shifted toward an ill-defined battlefield. The "front" of previous wars has given way to a "360-degree" battlefield where there is neither a well-defined area of combat nor a secure area.

The engagement of the US forces in asymmetric warfare has stressed the organization in ways unimagined in previous conflict. Holding key terrain and inflicting losses on your opponent define military success in conventional warfare. Yet, in an asymmetric campaign, key terrain is not an indicator of success and may, in fact, be a sign of weakness. For in an asymmetric campaign, the more terrain you control, the more terrain you must defend.

Previously, as in private business, the military organization that was sufficiently nimble to achieve strategic and tactical surprise had a significant advantage. Pearl Harbor, for example, allowed Japan a significant strategic and tactical advantage in the South Pacific. In asymmetric warfare, there is no well-defined opponent and tactical actions may have strategic consequences unlike actions in conventional warfare. In an asymmetric campaign, the counter-insurgent must defend its territory at all times; otherwise, the insurgent may claim success. By moving first, the counter-insurgent has established the conditions of failure, not success; the counter-insurgent establishes the environment to which the insurgent adapts. The counter-insurgent can no longer focus on terrain, but instead must focus on the dynamics of the population.

These examples illustrate how the organization of military campaigns has decisively changed during recent decades. It thereby indicates how organizational design may be a critical strategic factor. An unfit organization can undermine even the best strategies. Our examples also illustrate that military leaders (and business managers) must design organizations to support adaptive strategies and tactics in ways that challenge the idea of gaining positioning advantage in a stable context.

Our view, that organizational design is a critical strategic factor, contrasts with traditional ideas of positioning advantage that have guided strategists both in a military and in a business context. In business strategy, the traditional view is that firms should position themselves in attractive industries in a way that would best match their resource profiles. While this view is useful as a theoretical benchmark, the fact that both firms and industries are notably dynamic is in direct contrast. Data on industry life cycles and firm growth, for example, show that industries change dramatically, and that firms both alter the scale and the composition of their resource base (Geroski, 1995). Rather than aiming for positioning advantage, we find that it is more plausible to aim for a superior path in a changing context, a point of view that is consistent with recent arguments in research on business strategy (Adner and Levinthal, 2004). Strategic objectives define the path, and the organization is the vehicle that facilitates movement along this path—or perhaps leads the organization into an entirely different direction.

Given the importance of adapting, and tuning the properties of the organization, what are the basic constructs for understanding and analyzing the properties of organization design? The basic constructs for analyzing organization design are task structures, information structures, and knowledge structures (Puranam *et al.*, 2012). Task structures describe how managers allocate tasks to agents, as they define "who does what." Knowledge structures define "who knows what," and information structures define communication systems that update the agents' knowledge. In essence, organization design is the interplay between the designer's knowledge surrounding the division of tasks (architectural knowledge) and the agents' knowledge of how to integrate tasks (predictive knowledge). Predictive knowledge refers to knowledge that enables one unit (or agent) to act *as if* it can accurately predict another unit's (agent's) actions, thus enabling coordinated action (Puranam *et al.*, 2012). Organization designers, however, differ in their architectural knowledge, which allows them to minimize interdependence among the agents to different degrees. As top managers delegate authority further down the chain of command, they need less architectural knowledge to define task and information structures that ensure units can achieve coordinated action.

Modern militaries are highly centralized, while the adversaries they confront are typically highly decentralized. This suggests that centralized planning based on architectural knowledge is not an option for the designers of military organizations; they must rely much more on people on the ground forming predictive knowledge. This is not unlike the problems that Multi-National Corporations (MNCs) face when their subsidiaries are operating in vastly different contexts—centralized organization design is not really very useful. One challenge is how this development toward a decentralized organization can be made compatible with the military's general culture of standardization and uniformity. Can militaries learn from how MNCs organize? Another challenge relates to the formation of predictive knowledge. We have mentioned how modern IT, such as the BTF, can provide near real-time

information from a battlefield. However, this development does not necessarily lead to gains in predictive knowledge, such that one military unit can more accurately predict another unit's actions. To capture the potential of modern IT, it is necessary with a complementary redesign of the task structure of the organization (Puranam *et al.*, 2012).

The advance of information technology provides huge communication gains. This effect provides agents with higher levels of predictive knowledge and thereby enables more efficient coordination. However, advances in information technology also facilitate task allocation at higher levels of command. While it is easy to see that higher-level commanders may divide tasks more effectively than those residing at lower levels, it is unclear if they are also able to adapt information and task structures in ways that best favor the overall pursuit of strategic objectives. We believe that the implied tension between centralized task allocation and decentralized task completion may be particularly salient in modern military organizations. If true, we should be able to extract interesting and instructive cases that can advance our general understanding of design principles.

These concerns also suggest questions for future research. First, do advances in information technology generally favor a decentralized task structure, both in military organizations and MNCs? Second, to what extent is it possible to maintain tight operative control through centralized task allocation and, yet, allow decentralized task completion? Third, to what extent, if any, should Headquarters be limited in its access to direct information from ongoing operations? Fourth, is it possible to identify general strategic principles of organization design that apply both in military organizations, and private organizations such as MNCs?

8. Conclusion

Important topics for future research include comparative analysis of how business and military organizations adapt to influence a dynamic environment and how the forces of centralization and decentralization influence the evolution of these organizations. The question of how to deal with competitors or enemies that have no clear leader and function through an ecology of decomposed organizational structures remains an open question.

The overall challenge is to ensure that organizations are able to achieve coordinated action. This requires an organization design that effectively aligns task structures, information structures, and knowledge structures. In other words, we suggest that the pursuit of strategic objectives necessitates a joint trimming of structures that serve to achieve efficient task allocation and information processing, conditional on the scale of operations and the need to integrate contributions from specialists who possess deep knowledge in distinct domains. This view has a number of implications, including the observation that a pursuit of allocative efficiency is problematic unless it includes all the mentioned design parameters.

Effective organization design, however, not only facilitates leverage of the capabilities and technological resources that the organization controls at any given point in time, but it also assists the development and employment of future capabilities and technologies. The organization is a vehicle that managers can tune to achieve superior performance in stable conditions, but more interestingly, they can also design the organization to achieve strategic objectives in changing, uncertain, and critical conditions. In this regard, there is a notable gap in our understanding of adapting (rather than enforcing) structural conditions. Essential features of organization design, such as dynamic reallocation of tasks, reflect the problem inherent to adaptive design (Cohen *et al.*, 1972), which is a prominent feature of sports teams and military field operations. This difficulty is also of increasing importance in the corporate world given rapid changes in priorities and in operating conditions that force rapid redeployment of resources to tasks.

More generally, we are pointing to comparative studies of military and business organizations as a huge opportunity for advancing the literature on organization design. Even though the aims and modes of operation differ sharply in military and business organizations, we can compare directly the features of organizational design. This observation indicates that organizational researchers may benefit from a comparative study of the two kinds of organization.

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